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Traction Force Detection on Aligned Smooth Muscle Cell Sheet with Optical Sagnac Fiber Loop JINGYI YANG, Baylor University, YING ZHANG, YANGZI ZHENG, Nanyang Technological University, HO WAI LEE, Baylor University, LI HAN CHEN, VINCENT CHAN, Nanyang Technological University, XINYONG DONG, China Jiliang University, CHI CHIU CHAN, Nanyang Technological University — Engineered functional blood vessels have attracted a lot of attentions for tissue regeneration and wound healing. However, it remains a great challenge to recapitulate and monitor the characteristics of the blood vessels due to the three-dimension of histology. In general, the mechanotransduction of the vascular smooth muscle cells (SMCs) is critical for applications of engineering functional blood vessels. In this study, cell traction force (CTF) detection is experimentally achieved using an optical Sagnac fiber loop with a section of polarization-maintained fiber embedded into three-dimension microfabricated arrays of continuous microwalls. The 3D-microwalls are exploited for stimulating the formation of a highly aligned orientation of SMCs and collecting the CTF during the SMCs culture. Meanwhile, the embedded fiber of the Sagnac loop is employed to probe the CTF of the SMCs layer. The results indicated the traction force of SMCs sheet can be detected by monitoring the wavelength shifts of the interference fringes of the Sagnac fiber loop. Moreover, the spatial distributions and immunostaining of the SMCs further demonstrated and revealed the relation between the monolayer generated traction forces and optical fiber sensor detection.

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